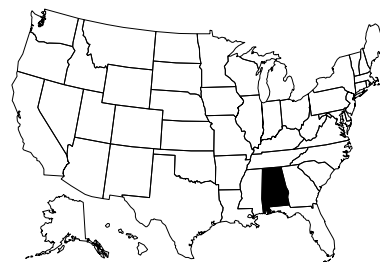


ALABAMA

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Program Description

In the last five years the Alabama Department of Environmental Management (ADEM) has assessed more than 1,100 river and stream locations as a part of six major long-term riverine-focused monitoring programs:

- Nonpoint Source Assessment Program
- Source Assessment Program
- Ecoregion Reference Assessment Program
- Upland Almap Monitoring and Assessment Program
- Clean Water Act §303(d) Support Assessment/Monitoring Program
- Fixed Ambient Trend Monitoring Program

The Field Operations Division's (FOD) benthic macroinvertebrate assessment program is an integral part of the Department's biological monitoring effort. A Multihabitat Bioassessment Protocol is currently utilized to sample Wadeable and nonwadeable streams. All methods utilized are documented in the Department's *Standard Operating Procedures and Quality Control Assurance Manual, Volume II* (ADEM 1999).

The Department has developed assessment criteria based on a ten-year ecoregional reference database. These assessments are then used to determine the Aquatic Life Use Designations. These comparisons have aided the Department in evaluating the "best attainable biotic community" within an ecoregion. The Department uses macroinvertebrates and a multi-habitat fish community assessment to evaluate water quality. Periphyton bioassessment methods are currently being tested as a more direct assessment of nutrient enrichment.

Biological integrity and water quality are directly affected by physical habitat. In addition, the assessment of habitat quality is an important step in documenting the adverse impacts of nonpoint source pollution. The Department utilizes the Habitat Assessment Matrices developed by EPA (USEPA 1989) and Barbour and Stribling (1994) in conjunction with physical characteristics and water quality parameters to evaluate and document the habitat quality of each Wadeable bioassessment sampling site. More intensive assessment of geomorphological survey methods are currently being implemented (in 2002) to evaluate sedimentation impacts.

Through contracts and cooperative efforts, other agencies have contributed valuable information, time, data, and other resources to the surface and ground water management program. These contributions have included sampling and analysis efforts; flow information; data contribution and management; and GIS development. The Alabama Water Watch (AWW) Program and Association routinely provides quality citizen volunteer monitoring data to ADEM. With so much water to manage and diminishing program funds, the "Alabama Water Watchers" play a key role in identifying waters that need immediate or long-term attention.

Documentation and Further Information

2000 Water Quality Report to Congress, 305(b) Report:
<http://www.adem.state.al.us/WaterDiv/Water%20Quality%20Info/305b/WQ305bReport.htm>

1996, 1998 and 2000 303(d) lists, listing and delisting criteria, and maps of listed waters:
<http://www.adem.state.al.us/WaterDiv/Water%20Quality%20Info/303d/WQ303d.htm>

ADEM. 1999. *Standard Operating Procedures and Quality Control Assurance Manual Volume II – Freshwater Macroinvertebrate Biological Assessment*. Field Operations Division ADEM, Montgomery, Alabama.

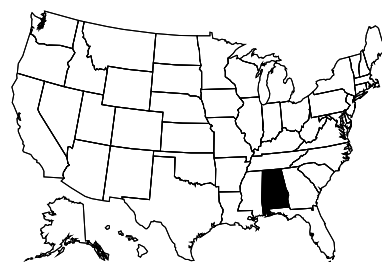
O'Neil, P.E., and T.E. Shepard. 1998. *Standard operating procedure manual for sampling freshwater fish communities and application of the index of biotic integrity for assessing biological condition of flowing, Wadeable streams in Alabama*. ADEM Contract No. AGY7042. Geological Survey of Alabama, Tuscaloosa, Alabama.

Barbour, M.T., and J.B. Stribling. 1994. A technique for assessing stream habitat structure. Pages 156-178 in *Conference proceedings, Riparian ecosystems in the humid U.S.: Functions, values, and management*. National Association of Conservation Districts, Washington, D.C. March 15-18, 1993, Atlanta, Georgia.

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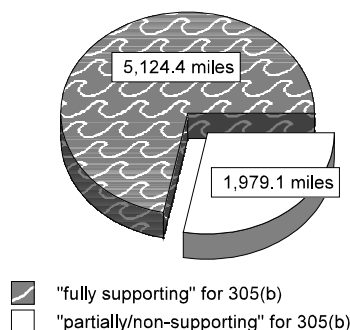
Programmatic Elements

| | | |
|---|-------------------------------------|---|
| Uses of bioassessment within overall water quality program | <input checked="" type="checkbox"/> | problem identification (screening) |
| | <input checked="" type="checkbox"/> | nonpoint source assessments |
| | <input checked="" type="checkbox"/> | monitoring the effectiveness of BMPs |
| | <input checked="" type="checkbox"/> | ALU determinations/ambient monitoring |
| | <input type="checkbox"/> | promulgated into state water quality standards as biocriteria |
| | <input checked="" type="checkbox"/> | support of antidegradation |
| | <input checked="" type="checkbox"/> | evaluation of discharge permit conditions |
| | <input checked="" type="checkbox"/> | TMDL assessment and monitoring |
| | <input type="checkbox"/> | other: |
| Applicable monitoring designs | <input checked="" type="checkbox"/> | targeted (i.e., sites selected for specific purpose) (<i>special projects and specific river basins or watersheds</i>) |
| | <input checked="" type="checkbox"/> | fixed station (i.e., water quality monitoring stations) (<i>special projects and comprehensive use throughout jurisdiction</i>) |
| | <input type="checkbox"/> | probabilistic by stream order/catchment area |
| | <input type="checkbox"/> | probabilistic by ecoregion, or statewide |
| | <input checked="" type="checkbox"/> | rotating basin (<i>special projects and specific river basins or watersheds</i>) |
| | <input type="checkbox"/> | other: |

Stream Miles

| | |
|---|----------------|
| Total miles | 77,274 |
| Total perennial miles | 47,077 |
| Total miles assessed for biology* | 7,103.5 |
| fully supporting for 305(b) | 5,124.4 |
| partially/non-supporting for 305(b) | 1,979.1 |
| listed for 303(d) | 1,979.1 |
| number of sites sampled (<i>on an annual basis</i>) | 200 |
| number of miles assessed per site | — |

7,103.5 Miles Assessed for Biology



*The above miles are the total river and stream miles assessed for biological *and* other (chemical, physical, etc.) effects. Strictly biological miles are as follows: 2,992.1 *monitored* miles and 5,524 *evaluated* miles were determined as "fully supporting" for 305(b) using bioassessment data. These miles do not include fish tissue monitoring data from streams and rivers.

Aquatic Life Use (ALU) Designations and Decision-Making

| | | |
|---|--|--|
| ALU designation basis | Fishery Based Uses | |
| ALU designations in state water quality standards | Three designations: Outstanding Alabama Water, Fish & Wildlife, Limited Warmwater Fishery | |
| Narrative Biocriteria in WQS | none - A narrative scale of condition is used to support criteria decisions. Draft guidelines, based upon ecoregional reference conditions, are used in the evaluation of aquatic macroinvertebrate community assessments. | |
| Numeric Biocriteria in WQS | none | |
| Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria) | <input checked="" type="checkbox"/> | assessment of aquatic resources |
| | <input checked="" type="checkbox"/> | cause and effect determinations |
| | <input checked="" type="checkbox"/> | permitted discharges |
| | <input checked="" type="checkbox"/> | monitoring (e.g., improvements after mitigation) |
| | <input checked="" type="checkbox"/> | watershed based management |
| Uses of bioassessment/biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU | none | |

Reference Site/Condition Development

| | | |
|--|--|--|
| Number of reference sites | 48 total | |
| Reference site determinations | <input type="checkbox"/> | site-specific |
| | <input type="checkbox"/> | paired watersheds |
| | <input checked="" type="checkbox"/> | regional (aggregate of sites) |
| | <input type="checkbox"/> | professional judgment |
| | <input type="checkbox"/> | other: |
| Reference site criteria | Local Soil and Water Conservation District (SWCD) estimates of landuse, animal densities, and sedimentation rates, etc. and departmental databases are used to identify potentially least-impaired sub-watersheds. | |
| Characterization of reference sites within a regional context | <input type="checkbox"/> | historical conditions |
| | <input checked="" type="checkbox"/> | least disturbed sites |
| | <input type="checkbox"/> | gradient response |
| | <input type="checkbox"/> | professional judgment |
| | <input type="checkbox"/> | other: |
| Stream stratification within regional reference conditions | <input checked="" type="checkbox"/> | ecoregions (or some aggregate) |
| | <input type="checkbox"/> | elevation |
| | <input type="checkbox"/> | stream type |
| | <input type="checkbox"/> | multivariate grouping |
| | <input type="checkbox"/> | jurisdictional (i.e., statewide) |
| | <input type="checkbox"/> | other: |
| Additional information | <input checked="" type="checkbox"/> | reference sites linked to ALU |
| | <input type="checkbox"/> | reference sites/condition referenced in water quality standards |
| | <input checked="" type="checkbox"/> | some reference sites represent acceptable human-induced conditions |

Field and Lab Methods

| | | |
|---|-------------------------------------|---|
| Assemblages assessed | <input checked="" type="checkbox"/> | benthos (100-500 samples/year; multiple seasons, multiple sites - broad coverage for watershed level) |
| | <input checked="" type="checkbox"/> | fish (<100 samples/year; multiple seasons, multiple sites - broad coverage for watershed level) |
| | <input type="checkbox"/> | periphyton (currently being tested for assessment of nutrient enrichment) |
| | <input checked="" type="checkbox"/> | other: phytoplankton (100-500 samples/year; multiple seasons, multiple sites - broad coverage for watershed level) |
| Benthos | | |
| sampling gear | | wash bucket, dipnet and kick net (1 meter); 500-600 micron mesh |
| habitat selection | | multihabitat |
| subsample size | | 100 per habitat |
| taxonomy | | family and genus |
| Fish | | |
| sampling gear | | backpack electrofisher and seine; 3/16" mesh |
| habitat selection | | pool/glide and riffle/run (cobble) |
| sample processing | | biomass - batch |
| subsample | | none |
| taxonomy | | species |
| Habitat assessments | | visual based; performed both with, and independent of, bioassessments |
| Quality assurance program elements | | standard operating procedures, quality assurance plan, periodic meetings and training for biologists, sorting and taxonomic proficiency checks, specimen archival |

Data Analysis and Interpretation

| | | |
|--|-------------------------------------|---|
| Data analysis tools and methods | <input checked="" type="checkbox"/> | summary tables, illustrative graphs |
| | <input type="checkbox"/> | parametric ANOVAs |
| | <input type="checkbox"/> | multivariate analysis |
| | <input checked="" type="checkbox"/> | biological metrics (<i>aggregate metrics into an index and return single metrics</i>) |
| | <input type="checkbox"/> | disturbance gradients |
| | <input type="checkbox"/> | other: |
| Multimetric thresholds | | |
| transforming metrics into unitless scores | | 95 th percentile of reference population |
| defining impairment in a multimetric index | | The 2000 305(b) report states that sampling results equal to or less than fair/moderately impaired for the macroinvertebrate index and chemical/physical field data indicate an impairment ("excellent, good, fair, poor, very poor" or "unimpaired, slightly impaired, moderately impaired, severely impaired") and will be considered non-support and placed on the 303(d) list. |
| Evaluation of performance characteristics | <input checked="" type="checkbox"/> | repeat sampling (<i>sampling - multiple crews same site/same day</i>) |
| | <input checked="" type="checkbox"/> | precision (<i>sampling, assessment and identification</i>) |
| | <input checked="" type="checkbox"/> | sensitivity (<i>sampling and assessment; standard level of identification</i>) |
| | <input checked="" type="checkbox"/> | bias (<i>identification - 10% peer review</i>) |
| | <input checked="" type="checkbox"/> | accuracy (<i>identification - 10% peer Quality Assurance; lab pick - 100% recheck; field pick - 10% returned to lab for re-check</i>) |
| Biological data* | | |
| Storage | | Aquatic macroinvertebrate data from 1990 to present are stored in a PACE mainframe database. ADEM has very recently developed an MS Access Fish IBI database and will begin data entry of this information as time allows. Historical macroinvertebrate data are stored in paper files. Fish IBI data are mostly in spreadsheets, but will eventually be included in the Access database. |
| Retrieval and analysis | | Both databases mentioned above include automated metric calculation. The macroinvertebrate database also allows some comparison of taxa lists between stations. |

*Additional resources are necessary to develop an in-house biological database module in Oracle that would be compatible with the Oracle Surface Water Quality Database currently under development. The current aquatic macroinvertebrate dataset and the fish community data would be migrated into this database module. STORET will not be used as the primary biological data storage and retrieval system.